Appendix E

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Epacris Environmental Consultants were engaged by NPWS in 2011 to investigate potential alignments of the proposed mountain bike track. The aim was to identify a route that would minimise impacts to the surrounding environment. In order to achieve this Epacris conducted a comprehensive flora and fauna survey in the Bantry Bay area of Garigal National Park
The survey incorporated both desk-top and field-based components (further details included in **Appendix B**).

The results of these surveys indicated that threatened species were present in the area and there was potential for impact from the proposed activity. Recommendations have also been provided by Epacris to mitigate these impacts.

The following seven-part tests were conducted on the threatened species identified in order to examine the level of impact and determine if further assessment was required.

SEVEN-PART TESTS FOR BANTRY BAY

Tetratheca glandulosa - Vulnerable (TSC Act (1995) and EPBC Act (1999)

Tetratheca glandulosa is a small, spreading shrub which grows 20 - 50cm in height. Stems often become entwined among other small shrubs, sedges and grasses. Leaves are opposite 5 - 10 mm long and 1 mm wide with recurved (rolled under) margins. Leaf margins have small stiff hairs that give them a "toothed" appearance. The flower stalk and sepals (leaf-like structure at base of flower) are covered with dark-red gland-tipped hairs, which distinguishes *T. glandulosa* from other *Tetratheca* species.

This species is restricted to the following Local Government Areas: Baulkham Hills, Gosford, Hawkesbury, Hornsby, Ku-ring-gai, Pittwater, Ryde, Warringah, and Wyong. There are approximately 150 populations of this plant ranging from Sampons Pass (Yengo NP) in the north to West Pymble (Lane Cove NP) in the south. The eastern limit is at Ingleside (Pittwater LGA) and the western limit is at East Kurrajong (Wollemi NP). There are historical collections of this species south to Manly, Willoughby and Mosman, however these populations are now extinct. The current north-south range is approximately 65km.

[1] **DISCLAIMER**
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Flowers of this species occur from July-November, however residual flowers may persist until late December. Flowering is influenced by seasonal weather conditions and/or the microclimate effects (eg. exposure) of each particular site.

Recommendations for this Species

- Development in or adjacent to populations should ensure that sufficient vegetative buffers exist to prevent habitat degradation and maintain habitat connectivity.
- Minimise habitat loss (in particular vegetation clearance within large populations and those at the edge of the species range).
- Maintain and improve habitat connectivity within and among populations.
- Restore degraded habitat using bush regeneration techniques.
- Minimise and/or prevent factors which promote habitat degradation (eg. large edge-area ratios, urban/agricultural runoff and stormwater, unrestricted access etc).

Source:
http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10798

Melaleuca deanei - Vulnerable (TSC Act (1995) and EPBC Act (1999)

Deane's Paperbark is a shrub to 3 m high with fibrous, flaky bark. New stems are furry and white, though the mature stems are hairless. The smooth leaves are not paired. They are narrow, to 25 mm long and 6 mm wide, with pointed tips. The many white flowers form spikes to 6 cm long, on a furry stem. The five petals are less than 5 mm long; each is paired with a bundle of 17 - 28 stamens. The woody fruits are barrel-shaped, to 7 mm in diameter.

Deane's Paperbark occurs in two distinct areas, in the Ku-ring-gai/Berowra and Holsworthy/Wedderburn areas respectively. There are also more isolated occurrences at Springwood (in the Blue Mountains), Wollemi National Park, Yalwal (west of Nowra) and Central Coast (Hawkesbury River) areas.

The species grows in heath on sandstone. Flowers appear in summer but seed production appears to be small and consequently the species exhibits a limited capacity to regenerate.

Recommendations for this Species

- Ensure that personnel planning and undertaking hazard reduction burns are able to identify the species and are aware of its habitat.
- Ensure that personnel planning and undertaking road maintenance are able to identify the species and are aware of its habitat.
- Develop a fire management plan for the population.
- Apply mosaic pattern hazard reduction techniques to ensure the same areas are not burned repeatedly.
- Survey thoroughly for Deane's Paperbark before granting development approval.
- Erect markers to alert road and track maintenance staff to the presence of a threatened species.
- Ecological study is required to try to understand the species capacity to regenerate.
- Mark Deane's Paperbark sites and potential habitat onto maps used for planning maintenance work.
- Mark Deane's Paperbark sites and potential habitat onto maps used for planning hazard reduction burns.

Source:
http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10515

Pimelea curviflora var. curviflora **- Vulnerable (TSC Act (1995) and EPBC Act (1999)**

Pimelea curviflora var. *curviflora* is a much-branched subshrub or shrub 20 to 120cm high with hairy stems. Flowers are red to yellow, hairy and occur in terminal heads of 4 - 12 flowers. Leaves are 5 - 10 mm long, 2 - 4 mm wide, with a sparsely hairy lower surface. The curved fruit is 2 - 4 mm long.

This species is confined to the coastal area of the Sydney and Illawarra regions. Populations are known between northern Sydney and Maroota in the north-west. It occurs on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands. *Pimelea curviflora* var. *curviflora* flowers from October to May. It has an inconspicuous cryptic habit as it is fine and scraggly and often grows amongst dense grasses and sedges. It may not always be visible at a site as it appears to survive for some time without any foliage after fire or grazing, relying on energy reserves in its tuberous roots.

Threats to this species include habitat loss due to clearing for urban development and habitat degradation due to for example, weed invasion, recreational activities, road and trail maintenance, and bush rock removal.

Recommendations for this Species

- Introduce measures to prevent habitat degradation related to unrestricted access and/or trail maintenance.
- Manage weed infestation.
- Protect areas of known and potential habitat from clearing and further fragmentation.

Source:
http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10629

Powerful Owl (*Ninox strenua*) – Vulnerable (TSC Act 1995)

The Powerful Owl is the largest owl in Australia. It is a typical hawk-owl, with staring yellow eyes and no facial-disc. Adults reach 60 cm in length, have a wingspan of up to 140 cm and weigh up to 1.45 kilograms. Males are larger than females. The upper parts of the Powerful Owl are dark, greyish-brown with indistinct off-white bars. The underparts are whitish with dark greyish-brown V-shaped markings. Juvenile Powerful Owls have a white crown and underparts that contrasts with its small, dark streaks and dark eye patches. The call of this species may be heard at any time of the year, but it is more vocal during the winter breeding season. It has a slow, deep and resonant double hoot, with the female's being higher pitched and expressing an upward inflection on the second note.

The Powerful Owl preys mainly on large arboreal mammals (80-90%), such as Brushtail Possum and Greater Glider. Smaller prey such as Ringtail Possum and Sugar Glider are also taken regularly, with some Grey-headed Flying-fox, rabbits and birds (NSW NP&WS, 1997). The home range varies from 600Ha to over 1000Ha.

The Powerful Owl lives as monogamous, sedentary life-long pairs in large permanent home ranges. The Owls nest in large tree hollows (at least 0.5m deep), in large eucalypts (diameter at chest height of 80-240 cm). During the breeding season the male Powerful Owl roosts in a 'grove' of up to 20-30 trees, situated within 100-200m of the nest tree where the female shelters. Nesting occurs from late autumn to mid-winter, but is slightly earlier in north-eastern NSW (late summer–mid-autumn). This species is long-lived and has high roost fidelity, using the same nest tree hollow year after year, generally producing 1-2 young per year. The clutch is 1-2 eggs; a single clutch is laid per year although, rarely, a replacement clutch may be laid if the first attempt fails early in the egg stage. The incubation period is 5 weeks. There is no data on egg success. Successful broods fledge 1-2 young. Fledging rates in NSW are at least 1.2 young per nesting attempt or at least 1.5 young per successful nesting attempt.

The Powerful Owl is found throughout eastern and south-eastern Australia. In NSW, it is widely distributed throughout the eastern forests from the coast inland to tablelands, with scattered, mostly historical records on the western slopes and plains. Although the species is widespread throughout its range, its habitat has been reduced or fragmented by clearing for agriculture, pine plantations, mining and major infrastructure, urban developments and by reductions in habitat quality.

'Clearing of native vegetation' is a Key Threatening Processes listed under the TSC Act 1995 that applies to the Powerful Owl.

Recommendations for this Species

- Conservation of remnant bushland
- Fire management for hollow bearing trees and prey species
- Avoid disturbance at nesting and roosting sites.

Source: Department of Environment and Conservation (NSW) (2006). NSW Recovery Plan for the Large Forest Owls: Powerful Owl (Ninox strenua), Sooty Owl (Tyto tenebricosa) and Masked Owl (Tyto novaehollandiae) DEC, Sydney

Grey-headed Flying Fox (*Pteropus poliocephalus*) – Vulnerable (TSC Act (1995) and EPBC Act (1999))

The Grey-headed Flying-fox is the largest Australian bat, with a head and body length of 23 - 29 cm. It has dark grey fur on the body, lighter grey fur on the head and a russet collar encircling the neck. The wing membranes are black and the wingspan can be up to 1 m. It can be distinguished from other flying-foxes by the leg fur, which extends to the ankle. Grey-headed Flying-foxes are found within 200 km of the eastern coast of Australia, from Bundaberg in Queensland to Melbourne in Victoria.

Flying Foxes occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Individual camps may have tens of thousands of animals and are used for mating, birth and the rearing of young. Site fidelity to camps is high with some camps being used for over a century.
Mating commences in January and a single young is born in October or November.

Flying Foxes travel up to 50 km to forage and Feed on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca and Banksia, and fruits of rainforest trees and vines.

Recommendations for this Species

- Protect roost sites, particularly avoid disturbance September through November.
- Identify and protect key foraging areas.
- Manage and enforce licensed shooting.
- Investigate and promote alternative non-lethal crop protection mechanisms.
- Identify powerline blackspots and implement measures to reduce deaths.

Source: http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10697

Red-Crowned Toadlet (*Pseudophryne australis*) – Vulnerable (TSC Act 1995)

The Red-crowned Toadlet is an unmistakable small frog, usually measuring less than 30 mm long. It is dark brown to black, with distinctive reddish-orange patches, one between the eyes and one along the rump. It also has a white patch at the base of each arm. The belly is marbled black and white. The tadpoles are black and reach about 25 mm. The short, grating and "squelchy" call can be heard all year round.

The Red-crowned Toadlet has a restricted distribution. It is confined to the Sydney Basin, from Pokolbin in the north, the Nowra area to the south, and west to Mt Victoria in the Blue Mountains.

Occurs in open forests, mostly on Hawkesbury and Narrabeen Sandstones. Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings. Shelters under rocks and amongst masses of dense vegetation or thick piles of leaf litter. Red-crowned Toadlets are quite a localised species that appear to be largely restricted to the immediate vicinity of suitable breeding habitat. Red-crowned Toadlets are usually found as small colonies scattered along ridges coinciding with the positions of suitable refuges near breeding sites. Due to this tendency for discrete populations to concentrate at particular sites, a relatively small localised disturbance may have a significant impact on a local population if it occurs on a favoured breeding or refuge site.
Threats to this species include climate change, clearing of habitat, particularly along ridges, reduction in water quality flowing from ridges, particularly near urban areas, high frequency fire, resulting in changing vegetation structure and composition, collection of bush rock and disease (chytrid fungus).

Recommendations for this Species

- Apply mosaic pattern hazard reduction techniques.
- Do not remove sandstone rock from bushland in escarpment areas.
- Retain and protect habitat and buffers around habitat, particularly vegetation on upper slopes and ridges.
- Protect water quality and maintain natural water flows in drainage lines below developed ridges.

Source: http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10692

Eastern Bentwing Bat (*Miniopterus schreibersii oceanensis*) – Vulnerable (TSC Act 1995)

The Eastern Bent-wing Bat has chocolate to reddish-brown fur on its back and slightly lighter coloured fur on its belly. It has a short snout and a high 'domed' head with short round ears. The wing membranes attach to the ankle, not to the base of the toe. The last bone of the third finger is much longer than the other finger-bones giving the "bent wing" appearance. It weighs up to 20 grams, has a head and body length of about 6 cm and a wingspan of 30 - 35 cm.

Eastern Bent-wing Bats occur along the east and north-west coasts of Australia. Caves are the primary roosting habitat, but they have also been known to use derelict mines, storm-water tunnels, culverts, buildings and other man-made structures.

The preferred habitat of the Eastern Bent-wing bat is the well timbered valleys along the east coast and ranges from Queensland to Victoria. This species is the predominant cave-dwelling bat in south-eastern Australia, and up to 3000 individuals per square metre can be found packed together on the ceilings of caves, mines, disused railway tunnels and storm water drains. The Eastern Bent-wing travels very long distances between roosts according to seasonal needs. Considered common until a few years ago, it is now regarded as rare and vulnerable.

Female Bentwing Bats form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young. In the Eastern Bent-wing Bat, mating occurs in September in the north of their range and in May to June in the south of their range (when the embryo remains dormant until hibernation ends in August). In spring, females from a wide range congregate in nursery caves which are selected for their constant high temperature and humidity, these nursery caves are used year after year and colonies can consist of up to 150,000 individuals. A single young is born in late November or early December. The young, which become independent in February - March can disperse over hundreds of kilometres. Sexual maturity is reached in the second year of life.

Maternity caves have very specific temperature and humidity regimes, only a handful of maternity caves are known in NSW. At other times of the year, populations disperse within about 300 km range of the maternity caves. Cold caves are used for hibernation in southern Australia. Breeding or roosting colonies can number from 100 to 150,000 individuals. Bentwing Bats hunt in forested areas, catching moths and other flying insects above the tree tops.

Threats to this species include damage to or disturbance of roosting caves, particularly during winter or breeding, loss of foraging habitat, application of pesticides in or adjacent to foraging areas, predation by feral cats and foxes.

Recommendations for this Species

- Control foxes and feral cats around roosting sites, particularly maternity caves.
- Retain native vegetation around roost sites, particularly within 300 m of maternity caves.
- Minimise the use of pesticides in foraging areas.
- Protect roosting sites from damage or disturbance.

Source: http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10534

Superb Fruit Dove (*Ptilinopus superbus)*- Vulnerable (TSC Act 1995)

The Superb Fruit-dove is a small pigeon, approximately 24 cm in length. The male is brightly coloured, with golden-green upperparts, a brilliant orange-vermilion neck, and a rich purple crown. The tail is short and tipped with white. The throat and breast are grey with a lilac tinge, and a broad black band on the lower breast separates the grey breast from the creamy-white belly and green flanks. The female is light green on the back, has a small purple spot on the crown, and no dark breast band. The call is a distinctive cooing, rising in pitch and volume to a loud and clear 'whoop, whoop'. Also gives a low 'oom' in a steady sequence.
The Superb Fruit-dove occurs principally from north-eastern in Queensland to north-eastern NSW. It is much less common further south, where it is largely confined to pockets of suitable habitat as far south as Moruya.
The superb fruit dove inhabits rainforest and similar closed forests where it forages high in the canopy, eating the fruits of many tree species such as figs and palms. It may also forage in eucalypt or acacia woodland where there are fruit-bearing trees. Breeding takes place from September to January. The nest is a structure of fine interlocked forked twigs, giving a stronger structure than its flimsy appearance would suggest, and is usually 5-30 metres up in rainforest and rainforest edge tree and shrub species.
Threats to this species include clearing and degradation of rainforest remnants.

Recommendations for this Species

Retain and protect rainforest remnants.

Source:
http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10709

Spotted-tailed Quoll (*Dasyurus maculatus*) - Vulnerable TSC Act (1995) and Endangered EPBC Act (1999)

The Spotted-tailed Quoll is about the size of a domestic cat, from which it differs most obviously in its shorter legs and pointed face. The average weight of an adult male is about 3500 grams and an adult female about 2000 grams. It has rich-rust to dark-brown fur above, with irregular white spots on the back and tail, and a pale belly. The spotted tail distinguishes it from all other Australian mammals, including other quoll species. However, the spots may be indistinct on juvenile animals.

Spotted-tailed Quolls are large carnivores that utilise extensive home ranges and will hunt for food over large areas, including urban areas. Spotted-tailed Quolls tend to prefer open to closed forests in cool, wet, moderately rugged topography and require rock caves, tree hollows or hollow logs for dens sites. This species mates in winter, and the young are born in late Spring, early summer. The young are dependant until 4 months old.

The range of the Spotted-tailed Quoll has contracted considerably since European settlement. It is now found on the east coast of NSW, Tasmania, eastern Victoria and north-eastern Queensland. Only in Tasmania is it still considered common. It is mostly nocturnal, although will hunt during the day; spends most of the time on the ground, although also an excellent climber and may raid possum and glider dens and prey on roosting birds.

This species has been recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces as den sites. Consumes a variety of prey, including gliders, possums, small wallabies, rats, birds, bandicoots, rabbits and insects; also eats carrion and takes domestic fowl.

Threats to this species include Loss, fragmentation and degradation of habitat, accidental poisoning during wild dog and fox control programs. Deliberate poisoning, shooting and trapping may also be an issue. Competition with introduced predators such as cats and foxes.

Recommendations for this Species

- Consult with OEH if Spotted-tailed Quolls are raiding poultry, rather than taking direct action.
- Undertake cat and fox control using poison-baiting techniques least likely to affect quolls.
- Consult with OEH if any poison baiting is to be conducted in and immediately adjacent to areas where Spotted-tailed Quolls are known or likely to occur.
- Retain and protect large, forested areas with hollow logs and rocky outcrops, particularly areas with thick understorey or dense vegetation along drainage lines.

Source:
http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/profile.aspx?id=10207

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Tetratheca glandulosa

This species has been recorded at several locations within Bantry Bay. Where necessary the proposed track line has been re-routed around these populations.

It is considered that the action proposed will not have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Melaleuca deanei

The area was surveyed thoroughly for the presence of *Meleleuca deanei* where it has been recorded at one location along the proposed track route within Bantry Bay. Where necessary the proposed track line has been re-routed around this population.

It is considered that the action proposed will not have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Pimelea curviflora* var. *curviflora

This species has been recorded at several locations within Bantry Bay (NSW Wildlife Atlas), however it was not found during the flora surveys along the proposed track route at Bantry Bay.

It is considered that the action proposed will not have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Powerful Owl (*Ninox strenua*)

Powerful Owl have been recorded within this area in the past, however none were detected during the fauna survey.

It is unlikely that the degree of low-level vegetation removal required for the purposes of the track construction will impact upon any roost trees or food species for the Powerful Owl. No mature trees will be removed, and tree hollows used for nesting by this species will not be affected by the proposal.

The action proposed is not considered to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Grey-headed Flying Fox (*Pteropus poliocephalus*)

Grey-headed Flying Fox individuals range widely and existing records in this area are likely to be of animals feeding in flowering Eucalypts. The closest known colony of this species is several kilometres away.

Large trees will not be removed for the purposes of track construction. The degree of vegetation removal that will occur along the track is low and no feed trees or potential roosting trees will be removed.

It is considered that the action proposed will not have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Red-Crowned Toadlet (*Pseudophryne australis*)

Red-crowned Toadlets are quite a localised species that appear to be largely restricted to the immediate vicinity of suitable breeding habitat. This species has a tendency to form discrete populations that concentrate at particular sites, for this reason a relatively small localised disturbance may have a significant impact on a local population if it occurs on a favoured breeding or refuge site.

This species was identified at several locations along the proposed track route. Wherever an alternate route was feasible, this was taken to avoid impacting on the habitat for this species. Where re-routing was not possible or would result in an increased environmental impact, the track route was directed to cross bedrock. in order to protect water quality and maintain natural drainage lines.

It is considered that the proposed activity will not have an adverse effect on the life cycle of this species and will not place a viable population of this species at risk of extinction.

Eastern Bentwing Bat (*Miniopterus schreibersii oceanensis*)

Although this bat species may utilise tree hollows on an opportunistic seasonal basis in the general area, no trees are proposed to be removed during track construction works, and no permanent maternity roosts are located within the area.

It is considered that the proposed activity will not have an adverse effect on the life cycle of this species and will not place a viable population of this species at risk of extinction.

Superb Fruit Dove (*Ptilinopus superbus)*

The superb fruit dove inhabits rainforest and similar closed forests where it forages high in the canopy, eating the fruits of many tree species such as figs and palms. It may also forage in eucalypt or acacia woodland where there are fruit-bearing trees. The sightings in this area are more likely to have occurred in the wet forested gullies, when some trees were fruiting.

It is considered that the proposed activity will not have an adverse effect on the life cycle of this species, or place a viable population of this species at risk of extinction.

Spotted-tailed Quoll (*Dasyurus maculatus*)

This species has been recorded in the area, however due to their large home ranges, and the small area of the proposed track works, no impact on core habitat for this species will occur. No potential den sites exist within the area of proposed works.

It is considered that the proposed activity will not have an adverse effect on the life cycle of this species, or place a viable population of this species at risk of extinction.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

Tetratheca glandulosa
Melaleuca deanei
Pimelea curviflora* var. *Curviflora
Powerful Owl *(Ninox strenua)*
Grey-headed Flying Fox (*Pteropus poliocephalus*)
Red-Crowned Toadlet (*Pseudophryne australis*)
Eastern Bentwing Bat (*Miniopterus schreibersii oceanensis*)
Superb Fruit Dove (*Ptilinopus superbus)*
Spotted-tailed Quoll (*Dasyurus maculatus*)

An endangered population is defined under the TSC Act as 'a population specified in Part 2 of Schedule 1'. At the present time, there are no endangered populations of these species listed under the Act.

(c) In the case of a critically endangered or endangered ecological community, whether the action proposed:
(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or
(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Tetratheca glandulosa
Melaleuca deanei
Pimelea curviflora* var. *Curviflora
Powerful Owl *(Ninox strenua)*
Grey-headed Flying Fox (*Pteropus poliocephalus*)
Red-Crowned Toadlet (*Pseudophryne australis*)
Eastern Bentwing Bat (*Miniopterus schreibersii oceanensis*)
Superb Fruit Dove (*Ptilinopus superbus)*
Spotted-tailed Quoll (*Dasyurus maculatus*)

These species are not listed as Endangered Ecological Communities.

(d) In relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed,

The proposed activity involves the construction of sections of new purpose-built mountain bike track, which will necessitate the removal of some native vegetation. Vegetation clearance will be restricted to the trimming of branches and the removal of small amounts of understorey species, necessary to facilitate the construction of 3.75km of single-width track with an operational width of 600-700mm. The track is designed to incorporate the natural obstacles and features of the environment, including trees and boulders, and will direct riders to follow a 'one-way' direction. In some areas surface armouring using imported rock such as sandstone will be used to protect the track surface, minimise erosion and facilitate appropriate drainage.

Tetratheca glandulosa

The proposed track line has been diverted around known populations of this species at this location, and habitat for this species will not be directly impacted by vegetation clearing Some areas of track may remove potential habitat, however these areas are small in relation to the reserve, and extensive areas of potential habitat remain.

Threats to this species include habitat loss and habitat degradation due to factors such as increased runoff and unrestricted access. Threats to habitat currently exist in this area due to the creation and use of numerous unauthorised tracks that are present in this section of Bantry Bay. The proposed activity may focus bike riding activity away from these tracks and onto a purpose-built track which is designed to incorporate features to manage drainage, runoff and erosion more effectively.

Melaleuca deanei

The area was surveyed thoroughly for this species which was identified at one location. The proposed track route has been diverted around this location in order to avoid directly impacting on this species. Some areas of track construction may result in the removal of some potential habitat, however these areas are considered small in relation to the surrounding reserve, and extensive areas of potential habitat remain.

Pimelea curviflora* var. *curviflora

The proposed track line has been diverted around the mapped locations of this species, however none were sighted during the survey.

Threats to this species include habitat loss and habitat degradation due to weed invasion and recreational activities. Although the track construction may involve the removal of small amounts of potential habitat, these areas are small in relation to the surrounding environment.

The threat from weed invasion currently exists in this area as a consequence of recreational activity, as it is a popular area for visitation and contains a number of walking tracks and access trails. The threat is further impounded by the numerous unauthorised tracks and trails that have been constructed in the area. The proposed activity may focus bike riding activities away from

unauthorised tracks and onto a purpose-built track where the impact from weeds may be more effectively managed.

Powerful Owl (*Ninox strenua*)

Habitat for this species is present on site. This species forages over a wide area for arboreal marsupials and birds, the proposed track will not remove or modify a large extent of the habitat for this species or its prey species. No large trees will be removed as a result of this proposal, and trees used for roosting or nesting purposes will not be affected.

Grey-headed Flying Fox (*Pteropus poliocephalus*)

The amount of habitat to be removed during track construction is predominantly shrub layer, and no large trees will be required to be removed. This highly mobile species will not be impacted by the removal of habitat.

Red-Crowned Toadlet (*Pseudophryne australis*)

This species was identified at several locations along the proposed initial track route. Wherever an alternate route was feasible, this was taken to avoid impacting on the habitat for this species. Where re-routing was not possible, or would result in increased environmental impact, the track was diverted to cross bedrock in order to minimise the risk from increased siltation of the drainage lines, which are favoured by this species. Where this was not possible the use of raised platforms or 'floating' fibreglass mesh platforms will be used in the track construction. Platforms of this type are designed to have a minimal impact on the ground surface, and impact is anticipated to be restricted to the installation period, and if removal is ever required, will leave no permanent trace on the surrounding environment.

It is considered that no habitat for this species will be removed and only a minimal amount may require modification in the form of the incorporation of raised platform type structures, as a result of the proposed activity.

Eastern Bentwing Bat (*Miniopterus schreibersii oceanensis*)

The Eastern Bentwing Bat is likely to use the area for foraging, however it is considered that the proposed works will not impact upon this use. No core habitat for the Eastern Bentwing Bat is located within the area proposed for track works and no core habitat for this species will be removed or modified as a result of the action proposed.

Superb Fruit Dove (*Ptilinopus superbus)*

The Superb Fruit Dove is likely to use this area opportunistically depending on fruiting trees in the wetter forest areas of the reserve. No large trees of any type are to be removed for the proposal. No core habitat for this species will be removed or modified as a result of the action proposed.

Spotted-tailed Quoll (*Dasyurus maculatus*)

Due to the small size of the reserve, the Spotted-tailed Quoll may no longer reside in this area, as this species requires a large home range and was not identified during the survey. There have

been no sightings of this species in the area in recent years. No core habitat for Spotted-tailed Quoll is located within the area proposed for track works.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

Tetratheca glandulosa
Melaleuca deanei
Pimelea curviflora* var. *curviflora
Grey-headed Flying Fox (*Pteropus poliocephalus*)
Red-Crowned Toadlet (*Pseudophryne australis*)
Eastern Bentwing Bat (*Miniopterus schreibersii oceanensis*)
Superb Fruit Dove (*Ptilinopus superbus)*
Spotted-tailed Quoll (*Dasyurus maculatus*)

The construction width of the proposed purpose-built bike track will be 1-2 metres, and will decrease to 600-700mm as an operational standard (allowing for edge re-growth). This is not considered to be of such an extent that it will fragment or isolate areas of habitat from other areas of habitat for these species, or create a barrier to their movement.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

Tetratheca glandulosa
Melaleuca deanei
Pimelea curviflora* var. *Curviflora
Powerful Owl *(Ninox strenua)*
Grey-headed Flying Fox (*Pteropus poliocephalus*)
Red-Crowned Toadlet (*Pseudophryne australis*)
Eastern Bentwing Bat (*Miniopterus schreibersii oceanensis*)
Superb Fruit Dove (*Ptilinopus superbus)*
Spotted-tailed Quoll (*Dasyurus maculatus*)

The small amount of habitat to be removed or modified in relation to the surrounding environment is not considered to be significant for any of the above species, and is not anticipated to impact upon the long-term survival of the species, population or ecological community in the locality.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

Tetratheca glandulosa
Melaleuca deanei
Pimelea curviflora* var. *Curviflora
Powerful Owl *(Ninox strenua)*
Grey-headed Flying Fox (*Pteropus poliocephalus*)
Red-Crowned Toadlet (*Pseudophryne australis*)
Eastern Bentwing Bat (*Miniopterus schreibersii oceanensis*)
Superb Fruit Dove (*Ptilinopus superbus)*
Spotted-tailed Quoll (*Dasyurus maculatus*)

There is no critical habitat for these species listed in this area.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

Tetratheca glandulosa

There is currently no Recovery Plan or Threat Abatement Plan for this species.
The Priority Action Statement lists actions to recover this species, these include:

- Development in or adjacent to populations should ensure that sufficient vegetative buffers exist to prevent habitat degradation and maintain habitat connectivity.
- Minimise habitat loss (in particular vegetation clearance within large populations and those at the edge of the species range).
- Maintain and improve habitat connectivity within and among populations.
- Restore degraded habitat using bush regeneration techniques.
- Minimise and/or prevent factors which promote habitat degradation (eg. large edge-area ratios, urban/agricultural runoff and stormwater, unrestricted access etc).

The Proposed track route is consistent with these objectives.

Melaleuca deanei

There is a National Recovery Plan for this species:
'Department of Environment, Climate Change and Water (NSW) (2010), *Recovery Plan for Melaleuca deanei*'.

The recovery plan outlines 8 objectives for this species, the objectives relevant to this proposal are:
"Protect known occurrences of M. deanei using land-use and conservation planning mechanisms"

"To identify and minimise the threats operating at M. deanei sites."

"Management of threats to M. deanei on DECCW estate".

The Proposed track route has been re-routed to avoid the known populations of this species, and is therefore considered consistent with these objectives.

Pimelea curviflora* var. *curviflora

There is currently no Recovery Plan or Threat Abatement Plan for this species.
The Priority Action Statement lists actions to recover this species, these include:

- Introduce measures to prevent habitat degradation related to unrestricted access and/or trail maintenance.
- Manage weed infestation.
- Protect areas of known and potential habitat from clearing and further fragmentation.

The Proposed track route is consistent with these objectives.

Powerful Owl (*Ninox strenua*)

This species is represented in the Draft Recovery Plan for the Large Forest Owls (NPWS, 2005). The predominant threats include habitat removal and fragmentation, logging and fire. The recovery plan outlines 8 objectives for this species, the one relevant to this proposal is:

"***Minimise further loss and fragmentation of habitat by protection and more informed management of significant owl habitat (including protection of individual nest sites).***"

Vegetation removal for the track will be minimal and much of the track will be located on existing tracks. No large trees are required to be removed and the proposed activity is consistent with this objective.

Grey-headed Flying Fox (*Pteropus poliocephalus*)

There is currently no Recovery Plan or Threat Abatement Plan for this species.

The Priority Action Statement lists actions to recover this species, these include:

- Protect roost sites, particularly avoid disturbance September through November.
- Identify and protect key foraging areas.
- Manage and enforce licensed shooting.
- Investigate and promote alternative non-lethal crop protection mechanisms.
- Identify powerline blackspots and implement measures to reduce deaths.

The proposed activity is consistent with these objectives.

Red-Crowned Toadlet (*Pseudophryne australis*)

There is currently no Recovery Plan or Threat Abatement Plan for this species.

The Priority Action Statement lists actions to recover this species, these include:

- Apply mosaic pattern hazard reduction techniques.
- Do not remove sandstone rock from bushland in escarpment areas.
- Retain and protect habitat and buffers around habitat, particularly vegetation on upper slopes and ridges.
- Protect water quality and maintain natural water flows in drainage lines below developed ridges.

The Proposed track route has been planned to impact on this species as little as is possible. Where possible the track has been re-routed around habitat for this species, where re-routing was not possible or would result in increased environmental impact, the track will cross bedrock, this will not result in any increased siltation of the drainage lines in which this species occurs.

The proposed activity is consistent with these actions.

Eastern Bentwing Bat (*Miniopterus schreibersii oceanensis*)

There is currently no Recovery Plan or Threat Abatement Plan for this species. The Priority Action Statement lists actions to recover this species, these include:

- Control foxes and feral cats around roosting sites, particularly maternity caves.
- Retain native vegetation around roost sites, particularly within 300 m of maternity caves.
- Minimise the use of pesticides in foraging areas.
- Protect roosting sites from damage or disturbance.

The proposed activity is consistent with these actions.

Superb Fruit Dove (*Ptilinopus superbus)*

There is currently no Recovery Plan or Threat Abatement Plan for this species. The Priority Action Statement lists actions to recover this species, these include:

- Retain and protect rainforest remnants.

The proposed activity is consistent with this action.

Spotted-tailed Quoll (*Dasyurus maculatus*)

There is currently no Recovery Plan or Threat Abatement Plan for this species, however a National Recovery Plan is in preparation. The Priority Action Statement lists actions to recover this species, these include:

- Consult with OEH if Spotted-tailed Quolls are raiding poultry, rather than taking direct action.
- Undertake cat and fox control using poison-baiting techniques least likely to affect quolls.
- Consult with OEH if any poison baiting is to be conducted in and immediately adjacent to areas where Spotted-tailed Quolls are known or likely to occur.
- Retain and protect large, forested areas with hollow logs and rocky outcrops, particularly areas with thick understorey or dense vegetation along drainage lines.

The proposed activity is consistent with these objectives.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Tetratheca glandulosa
Melaleuca deanei
Pimelea curviflora* var. *Curviflora
Powerful Owl *(Ninox strenua)*
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Red-Crowned Toadlet (*Pseudophryne australis*)
Eastern Bentwing Bat (*Miniopterus schreibersii oceanensis*)
Superb Fruit Dove (*Ptilinopus superbus)*
Spotted-tailed Quoll (*Dasyurus maculatus*)

‘**Clearing of native vegetation’** is a listed threatening process under the Threatened Species Conservation Act (1995). Clearing is defined as “the destruction of a sufficient proportion of one or more strata (layers) within a stand or stands of native vegetation so as to result in the loss, or long term modification, of the structure, composition and ecological function of stand or stands.”

Clearing has the potential to destroy habitats for individual species, cause fragmentation of habitat, provide increased habitat for invasive species (incl. edge effects), cause loss of leaf litter layers, disrupt ecological function and cause changes to the soil biota.

No large scale clearing of vegetation is required for the proposed activity. No large trees (>50mm diameter) will be removed and the canopy will remain intact and interlocking. The construction and operation of a track measuring an operational width of 600-700mm is not considered to be of a scale that will cause fragmentation of habitat. The proposed track will also endeavour to retain the natural soil surface where possible, and will in time reclaim a large percentage of the litter layer.

It is not considered that the proposed activity will result in the long term modification, of the structure, composition and ecological function of the stands of vegetation on site.

'Infection of native plants by Phytopthora cinnamomi' is a listed Key Threatening Process under the Threatened Species Conservation Act (1995)

Phytophthora cinnamomi is a microscopic soilborne organism, invisible to the naked eye, which causes root rot of a wide variety of plant species including many native and introduced plants. Infection often results in the death of the plant, with early symptoms including wilting, yellowing and retention of dried foliage and darkening of young feeder roots and occasionally the larger roots. *Phytophthora* requires moist soil conditions and warm temperatures to be active, but damage is most evident in summer when plants are also prone to drought stress.

A plant infected by *Phytophthora* suffers destruction of root tissue which renders the plant unable to absorb water and nutrients, and the plant may subsequently die. The spores are easily transported in stormwater, drainage water, contaminated soil, and on tools, footwear and vehicles, including bicycles. *Phytophthora* is able to survive in dead plant tissue and in the soil for extended periods. This fungus is considered to be already present in many vegetation communities within the Sydney region, and unable to be controlled.

Infection of native plants by *Phytophthora cinnamomi* has been identified as a threat to a number of threatened species: Plants - *Epacris purpurascens* var. *purpurascens, Eucalyptus imlayensis, Genoplesium rhyoliticum, Leionema ralstonii, Tasmannia pupurascens, Westringia davidii,* and *Wollemia nobilis*. Animals affected by loss of habitat: Southern Brown Bandicoot and Smoky Mouse

All works conducted on National Park Estate are required to incorporate existing NPWS protocols and best practice guidelines relating to the management of pathogens such as *Phytopthera*. The proposed activity includes the construction of 3.75km of new track through bushland, and the utilisation of sections of existing management trails and walking tracks. The majority of this activity is restricted to an area where the exposure to the threat from the spread of pathogens via human activity currently exists.

The construction of the track may assist the long term management of *Phytopthora* as it will focus bike riding activities onto a purpose-built bike riding track and divert use away from unauthorised tracks and trails.

The proposed activity is considered unlikely to increase the impact of this Key Threatening Process.

'Introduction and Establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae' is a listed Key Threatening Process under the Threatened Species Conservation Act (1995).

Myrtle rust (*Puccinia psidii s.l.*) is a newly described fungus that is closely related to the Eucalyptus/Guava rusts. These rusts are serious pathogens which affect plants belonging to the family Myrtaceae including Australian natives like bottle brush (*Callistemon* spp.), tea tree (*Melaleuca* spp.) and eucalypts (*Eucalyptus* spp.).

Myrtle rust is distinctive in that it produces masses of powdery bright yellow or orange-yellow spores on infected plant parts. It infects leaves of susceptible plants producing spore-filled lesions on young actively growing leaves, shoots, flower buds and fruits. Leaves may become buckled or twisted and may die as a result of infection. Sometimes these infected spots are surrounded by a purple ring. Older lesions may contain dark brown spores. Infection on highly susceptible plants may result in plant death.

Myrtle rust can be spread from footwear or equipment that has previously been exposed to areas where it is present. The Myrtle Rust National Management Group have agreed that it is not technically feasible to eradicate this disease.

Activities that pose a high risk of introducing myrtle rust are those that involve disturbance of vegetation such as:

- clearing, slashing and weeding
- importing organic material such as mulch and tube stock
- off-track fauna and flora surveys.

There is potential for the activity to increase the impact from this Key Threatening Process, especially during the construction phase, where some clearing of vegetation is required.

All works conducted on National Park Estate are required to incorporate best-practice guidelines as outlined in the *Management plan for Myrtle rust on national park estate*, (OEH, 2011). The proposed activity also incorporates large sections of existing walking tracks and management trails, where threats from this key threatening process currently exist. No vegetation or organic material will be brought into the area for the purposes of track construction. Small amounts of vegetation clearing will be required in order to facilitate track construction. Vegetation clearance will be restricted to the shrub layer only and any trimmed or cleared material will be used to brushmat closed tracks or removed from the area.

The proposed activity is considered unlikely to increase the impact of this Key Threatening Process.

Weed Introduction

There are several listed key Threatening Processes under the Threatened Species Conservation Act (1995) that relate to weed invasion. The following are relevant to the Bantry Bay site:

- Invasion, establishment and spread of *Lantana camara*
- Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants

Any disturbance of natural vegetation can result in the spread of weed species. The construction and use of a bike track through natural bushland may also may act as a conduit for the spread of

weed seed and propagules that may be carried on the clothing and equipment of track users. Patches of weeds present at entry points to the track pose a risk from weeds being 'tracked' into bushland, and these will be removed prior to construction.

The proposed track includes the construction of 3.75km of new track through bushland, and the utilisation of sections of existing management trails and walking tracks. The majority of this activity is restricted to an area that is already prone to the threat from the spread of weeds. Numerous unauthorised tracks and trails currently exist in the area and potentially increase the threat from weed invasion. The construction of a purpose-built bike track may have a positive impact on the spread of weeds as it will divert access away from unauthorised tracks and onto a managed track, (where weeds may be more effectively managed), thereby containing the impacts from visitation.

The proposed activity is unlikely to increase the effects of this key Threatening Process.

In conclusion, is the proposed activity likely to have a significant effect on threatened species, populations, ecological communities or their habitats?

From the above seven part tests, we conclude that the proposed track construction is unlikely to have a significant impact on threatened species, populations, ecological communities or their habitats, and a Species Impact Statement is not required.